

Claims

1. A communication network, wherein the communication network comprises:
 - a plurality of network devices coupled to the communication network, wherein the plurality of network devices are operable to communicate with each other over the communication network by transmitting and receiving one or more data messages;
 - a first network device of the plurality of network devices, wherein the first network device comprises at least one of one or more inputs and one or more outputs; and
 - a second network device of the plurality of network devices, wherein the second network device is coupled to a first computer system;wherein a first data message of the one or more data messages comprises user configurable data, wherein the user configurable data is configured using the first computer system, wherein the first data message groups together one of a first of the one or more inputs and a second of the one or more inputs or a first of the one or more outputs and a second of the one or more outputs.
2. The communication network of claim 1,
 - wherein the network devices are further operable to transmit a configuration data message, wherein the configuration data message specifies content of the one or more data messages, wherein the configuration data message is created in response to said configuring.
3. The communication network of claim 1,
 - wherein the user configurable data is configured using the first computer system using a graphical configuration tool on the first computer system.
4. The communication network of claim 1,
 - wherein each one of the plurality of network devices comprises one or more of a transmitter and a receiver operable to said transmit and said receive the one or more data messages.

5. The communication network of claim 1,
wherein each one of the one or more inputs is operable to acquire one or more of
analog and discrete data; and
wherein each one of the one or more outputs is operable to generate one or more
of analog and discrete data.

6. The communication network of claim 1,
wherein at least one of the one or more data messages comprises at least one
channel of one or more of analog data and discrete data; and
wherein the first data message comprises one or more message arbitration IDs,
wherein each one of the one or more message arbitration IDs identifies the one or more
channels in the first data message.

7. The communication network of claim 1,
wherein the first data message comprises one or more channels of analog data,
wherein each one of the one or more channels of analog data comprises at least one byte
of data.

8. The communication network of claim 1,
wherein the first data message comprises one or more channels of discrete data,
wherein each one of the one or more channels of discrete data comprises at least one bit
of data.

9. The communication network of claim 1,
wherein the first data message comprises one or more channels of analog data;
wherein the first data message further comprises one or more channels of discrete
data; and
wherein the first data message is operable to combine one or more of the one or
more channels of analog data and the one or more channels of discrete data.

10. The communication network of claim 1,
wherein the user configurable data is operable to be stored in a configuration file;
and

wherein the configuration file is operable to be used by one or more applications
on the first computer system.

11. The communication network of claim 1,
wherein the communication network comprises one or more of:

- a CAN network;
- a CANOPEN network;
- a CAL network;
- a DeviceNET network; and
- any other type of an industrial network.

12. The communication network of claim 1, further comprising:
a graphical program that is operable to communicate with one or more of the first
network device and the second network device;

wherein the first data message is operable to be received and processed by the
graphical program.

13. The communication network of claim 12,
wherein the graphical program comprises a plurality of interconnected nodes that
visually indicate functionality of the graphical program.

14. The communication network of claim 12,
wherein the graphical program comprises a block diagram portion and a user
interface portion.

15. The communication network of claim 12,
wherein the graphical program comprises a graphical data flow program.

16. The communication network of claim 12,
wherein the graphical program is operable to perform one or more of:
an industrial automation function;
a process control function; and
a test and measurement function.
17. The communication network of claim 12,
wherein the graphical program is operable to be executed.
18. The communication network of claim 1, further comprising:
an application program that is operable to communicate with one or more of the
first network device and the second network device;
wherein the first data message is operable to be received and processed by the
application program;
wherein the application program comprises a program created in one or more of a
C, C++, Java, Visual Basic, and any other program development environment.
19. The communication network of claim 1,
wherein the first network device further comprises one or more modules;
wherein a first of the one or more modules on the first network device comprises
a network interface, wherein the network interface is operable to communicate on the
communication network by said transmitting and said receiving the one or more data
messages; and
wherein a second of the one or more modules on the first network device
comprises at least one of the one or more inputs and the one or more outputs.
20. The communication network of claim 1,
wherein the first network device is operable to be used in one or more of device
prototyping, automotive bench testing, in-vehicle testing, and data logging.
21. The communication network of claim 1,

wherein the first network device is operable to simulate a production device.

22. The communication network of claim 1,
wherein each one of the at least one of the one or more inputs and the one or more outputs can be updated by a network message by one or more of:

- periodical determinism;
- change of a state;
- reaching a predetermined level; and
- poll from the communication network.

23. The communication network of claim 22,
wherein the first network device contains a first data channel and a second data channel;

wherein the first network device is operable to transmit a first data message and a second data message; and

wherein the first data channel can be transmitted using a first mechanism using the first data message and the second data channel can be transmitted using a second mechanism using the second data message.

24. The communication network of claim 1,
wherein an acquisition of a first of the at least one of the one or more inputs and the one or more outputs by the first device is operable to trigger a transmission of data from a second of the at least one of the one or more inputs and the one or more outputs on the first device.

25. A flexible network system for network data transmission, wherein the data transmission occurs over a network, the flexible system comprising:

a first network device and a second network device, wherein both the first network device and the second network device are coupled to the network, wherein the first network device and the second network device are operable to communicate with

each other using the communication network by transmitting and receiving one or more data messages, wherein the first network device comprises at least one of one or more inputs and one or more outputs, wherein the second network device comprises at least one of one or more inputs and one or more outputs; and

a graphical configuration tool operable to configure contents of a first data message of the one or more data messages, wherein said configuring operates on both the first network device and the second network device;

wherein the first network device is operable to generate the first data message, wherein the first data message is operable to be propagated and received by the second network device, wherein the first data message groups together one of a first of the one or more inputs and a second of the one or more inputs or a first of the one or more outputs and a second of the one or more outputs.

26. The flexible network system of claim 25,

wherein the network devices are further operable to transmit a configuration data message, wherein the configuration data message specifies content of the one or more data messages, wherein the configuration data message is created in response to said configuring.

27. The flexible network system of claim 25,

wherein each one of the one or more inputs is operable to acquire one or more of analog and discrete data; and

wherein each one of the one or more outputs is operable to generate one or more of analog and discrete data.

28. The flexible network system of claim 25,

wherein the first data message further comprises data from the at least one of the one or more inputs and the one or more outputs.

29. The flexible network system of claim 25,

wherein at least one of the one or more data messages comprises one or more channels of one or more of analog data and discrete data;

wherein the first data message comprises one or more message arbitration IDs, wherein each one of the one or more message arbitration IDs identifies the one or more channels in the first data message.

30. The flexible network system of claim 25, further comprising:
a first computer system coupled to the network; and
a graphical program, wherein the graphical program is operable to communicate with one or more of the first network device and the second network device;
wherein the first data message is operable to be received and processed by the graphical program.

31. The flexible network system of claim 30,
wherein the graphical program comprises a plurality of interconnected nodes that visually indicate functionality of the graphical program.

32. The flexible network system of claim 30,
wherein the graphical program comprises a block diagram portion and a user interface portion.

33. The flexible network system of claim 30,
wherein the graphical program comprises a graphical data flow program.

34. The flexible network system of claim 30,
wherein the graphical program is operable to perform one or more of:
an industrial automation function;
a process control function; and
a test and measurement function.

35. The flexible network system of claim 30,

wherein the graphical program is operable to be executed.

36. The flexible network system of claim 25,
wherein each one of the at least one of the one or more inputs and the one or more outputs can be updated by a network message by one or more of:
periodical determinism;
change of a state;
reaching a predetermined level; and
poll from the communication network.

37. The flexible network system of claim 36,
wherein the first network device contains a first data channel and a second data channel;
wherein the first network device is operable to transmit a first data message and a second data message; and
wherein the first data channel can be transmitted using a first mechanism using the first data message and the second data channel can be transmitted using a second mechanism using the second data message.

38. A method for configuring network communication between a plurality of network devices, the method comprising:
coupling a first network device out of the plurality of network devices to a network;
coupling a second network device out of the plurality of network devices to the network, wherein the network is operable to communicate one or more data messages between the first network device and the second network device, wherein each of the first network device and the second network device comprises at least one of one or more inputs and one or more outputs, wherein the second network device is coupled to a first computer system;

configuring the at least one of the one or more inputs and the one or more outputs on the first network device;

configuring the at least one of the one or more inputs and the one or more outputs on the second network device;

configuring a first data message of the one or more data messages, wherein the first data message comprises data for the at least one of the one or more inputs and the one or more outputs, wherein the first data message contains one of input data and output data; and

propagating the first data message from the first network device to the second network device.

39. The method of claim 38,

wherein the network devices are further operable to transmit a configuration data message, wherein the configuration data message specifies content of the one or more data messages, wherein the configuration data message is created in response to said configuring.

40. The method of claim 38,

wherein at least one of the one or more data messages comprises one or more channels of one or more of analog data and discrete data; and

wherein the first data message comprises one or more message arbitration IDs, wherein each one of the one or more message arbitration IDs identifies the one or more channels in the first data message

41. The method of claim 38, further comprising:

a graphical program communicating with one or more of the first network device and the second network device;

wherein the first data message is operable to be received and processed by the graphical program.

42. The method of claim 41,

wherein the graphical program comprises a plurality of interconnected nodes that visually indicate functionality of the graphical program.

43. The method of claim 41,
wherein the graphical program comprises a block diagram portion and a user interface portion.

44. The method of claim 41,
wherein the graphical program comprises a graphical data flow program.

45. The method of claim 41,
wherein the graphical program is operable to perform one or more of:
an industrial automation function;
a process control function; and
a test and measurement function.

46. The method of claim 41, further comprising:
executing the graphical program.

47. The method of claim 38, further comprising:
an application program communicating with one or more of the first network device and the second network device;
wherein the first data message is operable to be received and processed by the application program;
wherein the application program comprises a program created in one or more of a C, C++, Java, Visual Basic, and any other program development environment.

48. The method of claim 38,
wherein said configuring the at least one of the one or more inputs and the one or more outputs on the first network device comprises user graphically configuring the at

least one of the one or more inputs and the one or more outputs on the first network device.

49. The method of claim 38,
wherein said configuring the at least one of the one or more inputs and the one or more outputs on the second network device comprises user graphically configuring the at least one of the one or more inputs and the one or more outputs on the second network device.

50. The method of claim 38,
wherein said configuring the first data message of the one or more data messages comprises user graphically configuring the first data message of the one or more data messages.

51. The method of claim 38,
wherein each one of the at least one of the one or more inputs and the one or more outputs can be updated by a network message by one or more of:
periodical determinism;
change of a state;
reaching a predetermined level; and
poll from the communication network.

52. The method of claim 51,
wherein the first network device contains a first data channel and a second data channel;
wherein the first network device is operable to transmit a first data message and a second data message; and
wherein the first data channel can be transmitted using a first mechanism using the first data message and the second data channel can be transmitted using a second mechanism using the second data message.

53. The method of claim 38,
wherein an acquisition of a first of the at least one of the one or more inputs and the one or more outputs by the first device is operable to trigger a transmission of data from a second of the at least one of the one or more inputs and the one or more outputs on the first device.